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54 Barrier means for intraoral radiography.

57 In oral radiography, there is a risk of cross-contamination as a result of inserting and removing dental x-ray packets from a patient's mouth. It is desired that the risk of cross-contamination be reduced. Described herein is an arrangement in which a dental x-ray film packet (28) is inserted into a disposable envelope (10) prior to insertion into the patient's mouth. The envelope (10) comprises a pair of flat, substantially rectangular wall members (12, 13) which are joined together along three adjacent edges by means of a heat seal (14). After the x-ray packet has been inserted into the envelope (10), flaps (18, 20) are sealed by means of an adhesive layer (26) applied to at least one of the flaps (18, 20). Once the x-ray packet has been exposed, it can be removed from the patient's mouth and then from its envelope (10) prior to normal processing and development. The presence of the envelope (10)

around the packet (28) during exposure prevents contamination of the packet (28) itself by saliva-borne microorganisms.

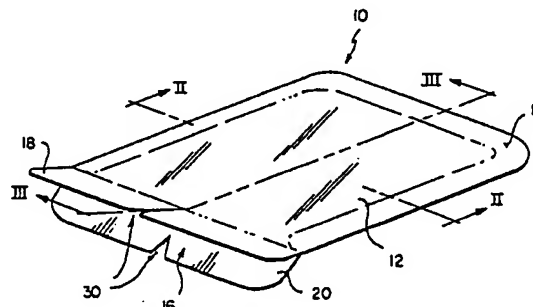


FIG. 1

**BARRIER MEANS FOR INTRAORAL RADIOGRAPHY**

The present invention relates to the field of oral radiography. More particularly, it relates to means for minimizing the probability of cross-contamination that may occur as a result of the insertion into, and removal from, a patient's mouth, of dental x-ray packets, during the performance of intraoral radiography.

Since as early as 1919, the potential for spread of disease through the handling of intraoral x-ray film packets has been recognized, and efforts have been made to deal with the problem. See U.S. Patent No. 1,370,858. Other patents related to dental x-ray film pack construction include U.S. Patents Nos. 1,293,323; 1,394,503; 1,437,827; 1,536,345; 1,738,467; 2,071,110; and 3,551,673. See also European Patent Application Publication No. 0 249 878 (published December 23, 1987), assigned to Nix Company, Ltd., Tokyo, Japan. This company has marketed two types of pouches for dental x-ray packs (under the trademarks SALIBAG and ENDBAG) that are designed to help prevent contacting the x-ray film with the patient's saliva.

However, there remains an urgent need for improved products and procedures to minimize the probability of cross-contamination as a result of the intraoral radiography process. To applicant's knowledge, the closest prior proposal to the barrier means of the present invention is that contained in the article entitled "A readily adaptable, cost-effective method of infection control for dental radiography," by Benjamin Ciola, DDS, MSD, which appeared at page 349 of JADA, Vol. 117, August, 1988. That proposal involves inserting the dental x-ray packet into a finger cot and knotting the finger cot before inserting the thus enclosed x-ray packet into the patient's mouth for intraoral radiography. After removal from the patient's mouth, the finger cot containing the exposed film packet is soaked in a chemical germicide, for example, glutaraldehyde, for 10 minutes, then removed, dried, and cut, whereupon the film packet is removed from the cut finger cot for conventional processing. This is a rather time consuming, inconvenient procedure; and there is some question as to the reliability of the knotting procedure in forming a barrier to the liquid and microorganisms. To the extent that the knot fails in this function, there is danger of either contaminating the x-ray packet or damaging the x-ray film by contact with the germicide. Moreover, neither this proposal nor the Nix devices discussed above provide substantially, flat, unfolded barrier envelopes that provide a complete peripheral seal surrounding the x-ray packet. Also, both types of devices present numerous folds and openings into which potentially contaminated saliva can seep.

It is therefore an object of the present invention to provide means for minimizing cross-contamination between patients, radiography technicians and radiogram handling equipment by saliva-borne microorganisms.

In accordance with one aspect of the present invention, we provide a disposable envelope for a dental x-ray film packet comprising an x-ray permeable receptacle characterized in that a sealable opening is provided for sealing the receptacle to provide a barrier for saliva and microorganisms when the film packet is inside the receptacle, the sealable opening being easily opened for removal of the exposed film packet for development with minimum risk of cross-contamination.

This envelope has a configuration that is adapted to completely enclose a selected dental x-ray film packet in close fitting relationship for insertion into a patient's mouth for intraoral radiography, and which can be easily opened after exposure of the packet to x-ray radiation without risk of cross-contamination.

In a preferred form, the receptacle comprises a pair of substantially flat rectangular wall members joined together along three adjacent edges, the sealable opening being arranged along the remaining edge.

The sealable opening may be defined by a pair of flaps formed in the wall members, at least one flap of each pair having a layer of adhesive provided thereon to effect sealing of the receptacle.

Advantageously, means are provided on the flaps to facilitate opening of the receptacle. In one embodiment, the means provided on the flaps to facilitate opening of the receptacle comprise facing notches formed in the flaps.

Each adhesive layer may be covered by a strip of release paper to prevent premature sealing of the sealable opening.

In accordance with a further aspect of the present invention, a method of minimizing the probability of cross-contamination as a result of oral radiography characterized by the steps of: sealing a selected dental x-ray film packet in an envelope of saliva and microorganism impermeable, x-ray transparent material to provide a saliva and microorganism impervious barrier around the packet;

inserting the sealed envelope into a patient's mouth and performing intraoral radiography; removing the envelope containing the exposed dental x-ray packet from the patient's mouth; wiping the exterior of the envelope with absorbent means promptly after its removal from the mouth so as to remove excess saliva therefrom;

opening the wiped envelope in such manner as to allow the exposed dental x-ray packet to be removed therefrom without touching the outside wall of the envelope or the handler; and processing the exposed dental x-ray packet.

Preferably, the x-ray packet is dropped into a clean container, such as a paper cup, upon opening the envelope and is transported to the processing site in the paper cup.

In the drawings:

FIG. 1 is a perspective view of a barrier envelope of the present invention;

FIG. 2 is a section view along line II-II of FIG. 1;

FIG. 3 is a section view along line III-III of FIG. 1; and

FIG. 4 is a section view similar to FIG. 3 illustrating an alternative embodiment of a barrier envelope of the present invention.

In general, the barrier envelope of the present invention is constructed of a flexible material that is impervious to liquids such as saliva as well as to microorganisms, for example polyethylene. It is so proportioned as to receive therewithin in relatively conforming fit a selected size of dental x-ray packet, and includes a sealable opening through which the x-ray packet may be inserted and which may thereafter be sealed to form a barrier to the passage of saliva and microorganisms. Preferably, it further comprises means to facilitate opening the envelope after intraoral radiography has been performed so as to assist in transferring the exposed x-ray packet from the envelope to conventional means for processing the x-ray packet in a manner that minimizes the likelihood of contamination of the packet, as well as of a person or equipment that handles or comes in contact with the exposed x-ray packet, with the patient's saliva.

A presently preferred barrier envelope in accordance with the present invention is illustrated in FIGS. 1-3. Referring particularly to FIGS. 1 and 2, barrier envelope 10 comprises a pair of substantially flat, rectangular walls 12, 13, of flexible, saliva and microorganism impermeable sheet material, such as polyethylene, joined along three edges by a saliva and microorganism impervious heat seal 14. At the fourth edge, envelope 10 is provided with a sealable opening 16 defined by flaps 18, 20 of walls 12, 13.

Referring, now, to FIG. 3, at least one of the facing surfaces 22, 24 of flaps 18, 20 is coated with a layer of adhesive 26, for example a rubber-based adhesive, capable of forming a saliva and microorganism impervious seal between flaps 18 and 20. Until the dental x-ray packet 28 (shown in phantom in FIG. 3) has been inserted into envelope 10 and it is desired to seal the envelope, each layer of adhesive 26 is covered by a strip of release paper

(not shown) to prevent premature sealing of opening 16. Packet 28 is conventional, so that no further details are necessary.

As shown in FIG. 1, flaps 18, 20 preferably include facing notches 30 at or near the midpoint of their edges to facilitate opening of a sealed envelope 10 for removal of an exposed x-ray packet 28 therefrom.

FIG. 4 illustrates alternative means for opening the sealed envelope after exposure of x-ray packet 28 and removal of the entire assembly from the patient's mouth. An envelope 40, otherwise substantially identical in construction to envelope 10 of FIGS. 1-3 has modified flaps 44, 45 at the ends of walls 42, 43 which are joined at three edges by heat seal 47 similarly to the joining of walls 12, 13 of the embodiment of FIGS. 1-3 by heat seal 14. The inner surfaces of flaps 44, 45 are different from surfaces 22, 24 of the embodiment of FIGS. 1-3 in that, instead of notches 30 of FIG. 1, the facing surfaces of flaps 44 and 45 are provided with adhesive-free outer zones 48, and inner zones 49, at least one of which is coated with an adhesive strip 50. As in the embodiment of FIGS. 1-3, each adhesive strip 50 is covered with a strip of release paper (not shown) until the x-ray packet 28 (shown in phantom) has been inserted and it is desired to seal envelope 40, whereupon the release paper is removed from adhesive strip 50 and opening 46 is sealed by joining zones 49. Adhesive free zones 48, however, remain unjoined and provide conveniently graspable peel strips for opening envelope 40 when it is desired to do so.

Various other devices can be employed as opening means. For example peel strips may be provided at the outer circumference of a portion of the envelope that is permanently sealed, as by a heat seal.

Also, while we presently prefer that the envelope of the present invention be constructed of polyethylene film such as those made from resins supplied by Exxon Corp. as Escorene PE LD-302.20 or by Dupont as Surlyn 1601 and that the adhesive be a rubber adhesive such as that sold by 3M as R-70 rubber adhesive, any suitable materials of construction, as well as sealing (and opening means) known to those skilled in the relevant arts may be employed in constructing envelopes of the present invention.

Of many acceptable materials, cellulose propionate, cellulose acetate, polycarbonate, polyethylene and polypropylene are among the best. Sheets of these substances are easily moldable and thermoplastic seals formed between two sheets of one of these materials are strong, yet easily peelable.

## Claims

1. A disposable envelope for a dental x-ray film packet comprising an x-ray permeable receptacle (10; 40) which is sealable to retain an x-ray film packet (28) and to allow the film packet to be removed after exposure characterized in that a sealable opening (16; 46) is provided for sealing the receptacle (10; 40) to provide a barrier for saliva and microorganisms when the film packet is inside the receptacle (10; 40), the sealable opening being easily opened for removal of the exposed film packet for development with minimum risk of cross-contamination.

2. An envelope according to claim 1 wherein the receptacle (10; 40) comprises a pair of substantially flat rectangular wall members (12, 13; 42, 43) joined together along three adjacent edges, the sealable opening (16; 46) being arranged along the remaining edge.

3. An envelope according to claim 2 wherein the sealable opening (16; 46) is defined by a pair of flaps (18, 20; 44, 45) formed in the wall members (12, 13; 42, 43), at least one flap of each pair having a layer of adhesive (26; 50) provided thereon to effect sealing of the receptacle (10; 40).

4. An envelope according to claim 3 wherein means (30; 48) are provided on the flaps (18, 20; 44, 45) to facilitate opening of the receptacle (10; 40).

5. An envelope according to claim 4 wherein the means provided on the flaps (18, 20) to facilitate opening of the receptacle (10; 40) comprise facing notches (30) formed in the flaps (18, 20).

6. An envelope according to any one of claims 3 to 5 wherein each adhesive layer (26; 50) is covered by a strip of release paper to prevent premature sealing of the sealable opening (16; 46).

7. An envelope according to any one of claims 3 to 6 wherein the adhesive (26; 50) comprises a rubber-based adhesive.

8. An envelope according to any one of claims 2 to 7 wherein the wall members (12, 13; 42, 43) are made from a thermoplastic heat sealable material, the receptacle (10; 40) being formed by joining the two wall members (12, 13; 42, 43) together using a heat seal (14; 47).

9. An envelope according to claim 8 wherein the thermoplastic heat sealable material is polyethylene.

10. An envelope according to claim 8 wherein the thermoplastic heat sealable material is polypropylene.

11. An envelope according to claim 8 wherein the thermoplastic heat sealable material is polycarbonate.

12. An envelope according to claim 8 wherein the thermoplastic heat sealable material is cellulose

propionate.

13. An envelope according to claim 8 wherein the thermoplastic heat sealable material is cellulose acetate.

14. A dental package comprising an x-ray film packet (28) sealed within an envelope according to any one of the preceding claims.

15. A method for minimizing the probability of cross-contamination as a result of oral radiography characterized by the steps of:-

sealing a selected dental x-ray film packet in an envelope of saliva and microorganism impermeable, x-ray transparent material to provide a saliva and microorganism impervious barrier around the packet;

inserting the sealed envelope into a patient's mouth and performing intraoral radiography;

removing the envelope containing the exposed dental x-ray packet from the patient's mouth;

wiping the exterior of the envelope with absorbent means promptly after its removal from the mouth so as to remove excess saliva therefrom;

opening the wiped envelope in such manner as to allow the exposed dental x-ray packet to be removed therefrom without touching the outside wall of the envelope or the handler; and

processing the exposed dental x-ray packet.

16. A method according to claim 15 wherein the x-ray packet is dropped into a clean container upon opening the envelope and is transported to the processing site in said container.

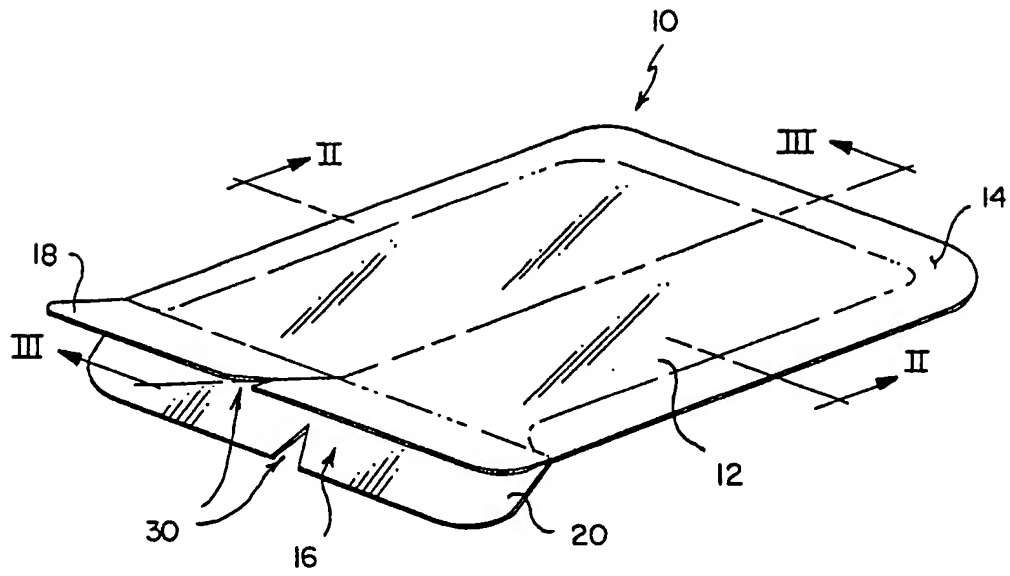


FIG. 1

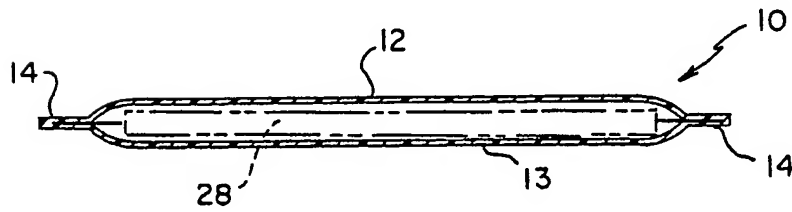


FIG. 2

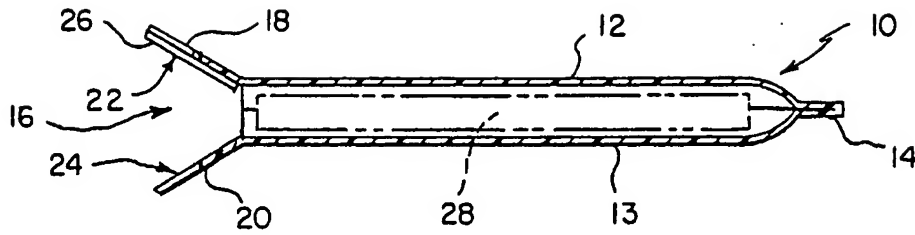


FIG. 3

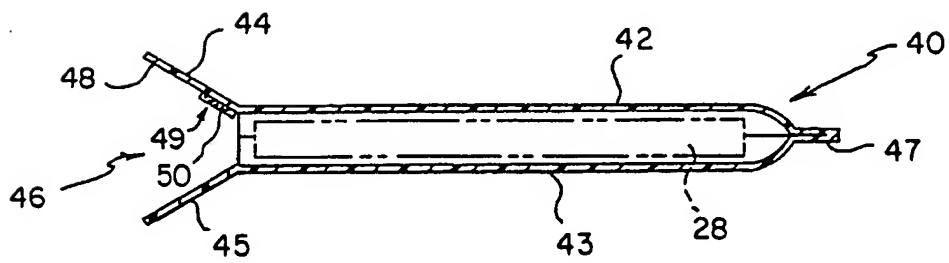


FIG. 4